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REPORT ON THE UNITED NATIONS REGIONAL CONFERENCE ON SPACE SCIENCE AND TECHNOLOGY FOR SUSTAINABLE DEVELOPMENT, ORGANIZED IN COOPERATION WITH THE GOVERNMENT OF INDONESIA

(Bandung, Indonesia, 17-21 May 1993)

CONTENTS

	Paragraphs	Page
INTRODUCTION	1-6	2
I. CONCLUSIONS	7-9	3
II. SUMMARY OF THE DISCUSSION	10-28	3
Annex. Programme of the Conference		8

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INTRODUCTION

1. The United Nations Regional Conference on Space Science and Technology for Sustainable Development was part of the contribution of the Government of Indonesia to the continuation of activities initiated for International Space Year 1992. The Conference was sponsored and organized jointly by the Government of Indonesia and the Office for Outer Space Affairs of the United Nations and was hosted by the Indonesian International Space Year Committee. The Conference was held at Bandung, Indonesia, from 17 to 21 May 1993.

2. The Conference focused on the role of space science and technology for sustainable development. In line with the goals of International Space Year and the particular needs of the States members of the Economic and Social Commission for Asia and the Pacific, the objectives of the Conference were as follows:

(a) To disseminate information of the progress of space science and technology and their utilization for economic development and improving the welfare of people, in particular, in developing countries in Asia and the Pacific;

(b) To promote the active participation of scientists, engineers and professional workers in developing countries in the development and application of space science and technology, in particular for the sustainable development of their countries;

(c) To deal with relevant global issues in the development and application of space science and technology, with a view to promoting further cooperation in the development and application of space science and technology between developed and developing countries for economic development and progress.

3. The Conference was attended by 182 scientists from 16 countries and 4 international or regional organizations. The participants came from the following countries, United Nations entities and national organizations: Australia, Bangladesh, Canada, China, Denmark, France, Germany, India, Indonesia, Japan, Malaysia, Netherlands, Pakistan, Singapore, Thailand and United States of America; the Office for Outer Space Affairs of the United Nations, the United Nations Educational, Scientific and Cultural Organization, and the International Telecommunication Union; and TONGASAT.

4. The Government of Indonesia and the United Nations provided financial assistance to 11 selected participants to cover the costs of international air travel or room and board or both. The selection was based on their contributions to the Conference as well as their financial needs. The organization of the Conference was mainly the responsibility of the Government of Indonesia. The Government also provided local transportation for all participants.

5. Opening addresses were made by Harijono Djojodihardjo, Chairman of the Scientific Organizing Committee for the Conference; H. Wiryosumarto, Chairman of the Indonesian International Space Year Committee; the Expert on Space Applications, Office for Outer Space Affairs, Karna Suwanda, Vice-Governor of the Province of Jawa Barat; and B. J. Habibie, Minister of State for Research and Technology, on behalf of the President of Indonesia.

6. The programme of the Conference consisted of seven plenary and seven technical sessions and two panel discussions. The plenary and technical sessions focused on the following topics: (a) environment and climate observations; (b) remote sensing; (c) space communications; (d) space science and technology; (e) future development, cooperation and commercialization of space; and (f) education. Nine keynote speeches were delivered at the plenary sessions and 130 technical papers were presented at the technical sessions. On 19 May 1993, the participants visited the Indonesian Aircraft Industry (PT.IPTN) facility at Bandung. On 20 and 21 May 1993, the panel discussions were held; the topics of the discussions were (a) cooperation and

education in space science and (b) technology in Asia and the Pacific. On 20 May 1993, four Conference participants gave lectures on topics related to space science and technology and their applications. Some 350 students from secondary schools and universities attended the lectures.

I. CONCLUSIONS

7. It was not the intention of the Conference to make recommendations. The discussion during the Conference focused on identifying the real needs of developing countries in Asia and the Pacific with regard to the development and applications of space science and technology. It was noted that technical capabilities were still lacking in most developing countries in the region and that the real needs of the region in space science and technology were predominantly related to education and cooperation.

8. Various elements related to education and cooperation in space science and technology were discussed. It was agreed that there was an urgent need to expand the opportunities of the countries in the region for better education in space science and technology and their applications. As for cooperation in space science and technology and their applications, the idea of establishing a regional centre for space programmes was raised and received considerable support. Some participants, however, stated that the idea should be carefully deliberated as there were many factors that could prevent such a centre from achieving its original purpose; they proposed the establishment of space centres in individual countries, to be linked with the regional centre. The resulting network would form the core of the cooperation between countries in space science and technology and their applications, and the functionality of such centres could be enhanced by, among other things, the exchange of expertise and information. It was also noted that cooperation could, to a large extent, reduce the high cost of the applications of space technology.

9. The participants also proposed that the Conference should be used as a vehicle to raise the awareness of States of the need for cooperation in areas of common interest related to national and regional development, including the following areas: the promotion of public awareness of the role of space science and technology and their applications for national development; human resource development; space applications such as telecommunications and remote sensing; monitoring and controlling global climatic change through space science and technology; and the development of scientific capacity. To that end, it was proposed that the Office for Outer Space Affairs, in cooperation with Governments in Asia and the Pacific, should organize a United Nations regional conference on space science and technology for sustainable development in a different country in the region every two or three years.

II. SUMMARY OF THE DISCUSSION

10. It was stated that sustainable development required the availability of accurate and timely information so that sound decisions could be made. In sustainable development, virtually everyone inevitably made decisions and used and provided information, such as data, knowledge and experiences. The need for information arose everywhere, at the international, national, grass-roots and individual levels. Although considerable information had already been collected, there was a need to collect more and different types of information - such as information that was global, regional or local in nature - in order to assess the state and development of important ecosystem, natural resource, pollution and socio-economic variables.

11. In many developing countries, and also at the international level, there was in general little or no capacity to gain access to, collect and analyse information and to disseminate relevant and timely information to users. Furthermore, there was a need to improve coordination between activities related to environmental and developmental data and the exchange of information on those activities, especially in the context of sustainability. Many commonly recorded indicators generally did not adequately cover the attributes of

sustainability, and in many instances methods for assessing the interactions between different sectoral environmental and developmental parameters were insufficiently developed or applied. As a result, the database containing such information often could not adequately support decision-making aimed at fostering sustainable and well-integrated environment and development systems.

12. Many countries were far from being able to collect all the data required for such decision-making. A number of developing countries lacked the resources to undertake such data collection programmes. At the regional level, even among the most economically advanced countries, much relevant information was lacking. And at the international level, the situation was not much better; the data that were available were not comprehensive.

13. There was a need to develop sustainable development indicators in order to provide a solid base for decision-making at all levels, thereby contributing towards a self-regulatory, sustainable, integrated environment and development system. Such indicators should be developed through a series of consultations and should incorporate the complex linkages between the environmental, economic and social features of natural and human systems. The information collection activities of Earthwatch should be strengthened, especially in the areas of urban air; freshwater and land resources, including forests, rangelands and other habitats; soil degradation; biodiversity; and global atmosphere.

14. Sustainable development required taking longer-term perspectives, integrating local and regional effects of global change into the development process, and using the best scientific and traditional knowledge available. The development process should be constantly re-evaluated in the light of scientific research findings to ensure that the impact of resource utilization on the earth-atmosphere system had been reduced. Environmental and developmental management policies must be scientifically sound, keeping open a range of options to ensure flexibility in making responses. There was often a communication gap between scientists, policy makers and the public at large, whose interests were articulated by both governmental and non-governmental organizations. Thus, there was a need to improve communication between scientists, decision makers and the general public.

15. Improving access to information generated at the national, regional and international levels involved strengthening existing national and international capacities to process and exchange information and to provide related technical assistance. It also involved Governments, together with international organizations, reviewing and reforming their national, regional and international information systems and services in sectors related to sustainable development, emphasizing the transforming of existing information into forms better suited for decision-making.

16. An important consideration of providing timely, relevant and detailed information on all critical aspects of sustainable development would be that it would make the process transparent and would facilitate expert and public participation. Those aspects would bring to the fore any important elements that might have been left out in the initial planning and would thus improve the overall scope and implementation of the measures. Creative approaches must be developed to ensure that the overwhelming volume of information required to deal with the wide range of sectoral and cross-sectoral issues within sustainable development was properly documented and shared. Governments should encourage among non-governmental organizations, bilateral donors, the private sector and the public at large the establishment of networking and coordinating mechanisms for sharing information on sustainable development projects.

17. The sciences were demonstrating the link between the concept of Earth as a life-support system and appropriate development strategies that built on its continued functioning. They were also playing an increasing role in making it possible to use renewable and non-renewable resources more efficiently. However, more extensive knowledge was required of the Earth's carrying capacity in the light of the rapidly changing global environment. Enhancing scientific understanding would therefore require development and

greater application of the more effective and efficient analytical and predictive tools available, such as remote-sensing devices and computer-modelling capabilities. National and international observation and information research networks should be established to compile data and information for the predictive modelling and assessment of environmental changes. Another important dimension was that of the human causes and consequences of environmental change; the study of those causes and consequences and of more sustainable development paths was essential.

18. Science was crucial to the prudent management of the Earth's environment and of its resources. The global life-support system was threatened with unprecedented environmental changes that, if unchecked, could seriously impair human development. Those threats required major preventive and corrective action, drawing on interdisciplinary scientific research to improve existing knowledge and understanding of land, oceans, atmosphere and their interlocking water, nutrient and biogeochemical cycles and energy flows, all of which formed part of the earth-atmosphere system. In the face of threats of irreversible environmental damage, lack of full scientific understanding should not be an excuse to postpone action that was justified in its own right. The precautionary approach could provide a basis for policies relating to complex systems that were not yet fully understood, systems for which consequences of disturbances could not yet be predicted.

19. The increasingly important role the sciences must play in dealing with environmental and development issues required all countries, and in particular developing countries, to build up their scientific capacity and capability. The goal was to enable them to participate on equal footing in the generation and application of results of scientific research and development concerning sustainable development. Some of the more important ways to facilitate that was through education, training, and improved incentives and local infrastructure for scientific research and development. Such capacity-building would also help improve public awareness and understanding of the sciences. If all countries were to participate on equal footing in negotiations on global environmental and developmental issues, scientists from developing countries must be able to participate fully in relevant international scientific research programmes. The exodus of scientists from developing countries should be reduced. Programmes should be initiated to increase the number of scientists in countries where their numbers were insufficient.

20. In order to promote sustainable development, more extensive knowledge was required of the Earth's carrying capacity, including the processes that could either impair or enhance its ability to support life. The global environment was changing more rapidly than at any time in recent centuries; as a result, surprises were likely, and the twenty-first century could bring significant environmental changes. At the same time, both total and per capita consumption of energy, water and non-renewable resources was increasing, and shortages might ensue in many parts of the world even if environmental conditions were to remain unchanged. Social processes were subject to multiple variations across time and space, regions and culture. They affected and were influenced by changing environmental conditions.

21. Meeting scientific research needs in the field of environment and development was only a first step to be taken by the sciences in providing support for sustainable development. The knowledge acquired might then be used to provide scientific assessments (audits) of the current status and of the situation under a range of possible future conditions. That implied that the biosphere must be maintained in a healthy state and that losses in biodiversity must be slowed down. Although many of the long-term environmental changes that were likely to affect people and the biosphere were global in scale, key changes could often be made at the national and local levels. At the same time, human activities at the local and regional levels often contributed to global threats, such as stratospheric ozone depletion. Thus, scientific assessments and projections were required at the global, regional and local levels.

22. Many countries and organizations had already prepared reports on the environment and development that contained reviews of current conditions and indications of future trends. Regional and global assessments should make full use of such reports but should be broader in scope and should include the results of detailed

studies of future conditions for a range of assumptions about possible future human responses, using the best available models. Such assessments should be designed to map out manageable development pathways within the environmental and socio-economic carrying capacity of each region. Full use should be made of traditional knowledge of the local environment.

23. In view of the increasing role the sciences had to play in dealing with the issues of environment and development, it was necessary to build up scientific capacity and strengthen such capacity in all countries, particularly in developing countries, in order to enable them to participate fully in the generation and application of the results of scientific research and development concerning sustainable development. There were many ways to build up scientific and technological capacity. Some of the most important of them were as follows: by providing education and training in science and technology; by providing assistance to developing countries to improve infrastructure for research and development, thereby enabling scientists to work more productively; by developing incentives to encourage research and development; and by making greater use of the results of research and development in the productive sectors of the economy. Such capacity-building would also form the basis for improving public awareness and understanding of the sciences. Emphasis must be placed on the need to assist developing countries in strengthening their capacities to study their own resource bases and ecological systems and to manage them better in order to meet national, regional and global challenges. Furthermore, in view of the size and complexity of global environmental problems, the need for more professionals specializing in several disciplines had become evident worldwide.

24. Sustainable development required the worldwide development and dissemination of technologies that were both environmentally sound and safe to use. Their development should be achieved through long-term partnership and cooperation, involving joint efforts by Governments and enterprises as suppliers of technology and its recipients. In such a partnership, attention should be given to the transfer of environmentally sound technologies from developed to developing countries, from developing to developed countries and from developing to developing countries. Environmentally sound technologies should be compatible with nationally determined socio-economic, cultural and environmental priorities.

25. Environmentally sound technologies encompassed total systems, which included know-how, procedures, goods and services, and equipment, as well as organizational and managerial procedures. Human resource development, including gender considerations, and capacity-building at the local level were therefore relevant aspects of technology choices.

26. Gaining access to and transferring those technologies and the capacity to develop and manage them were of particular importance to developing countries. Support should be provided to build the technological capacity of developing countries so that they could make more rational choices of technology, selecting technology that was relevant to their development. Furthermore, their capability to assess technologies should be expanded, particularly with regard to full-cost accounting, environmental risk evaluation and safeguards on technologies restricted or prohibited on environmental or health grounds in other countries. Programmes for regional and national scientific research, information dissemination and technology development should be intensified. Such programmes should be aimed at improving technology currently being used and/or replacing it with environmentally sound technology. New and efficient technologies were essential to sustaining the world economy, protecting the environment and alleviating poverty and human suffering.

27. It was stated that sustainable development required the availability, accessibility and transfer of technology and scientific information. Satisfying those requirements would enable Governments to make better informed choices and to strengthen domestic technological capabilities. Developing countries could gain access to much of the useful technology in the public domain if that technology were not covered by patents.

28. It was agreed that a "critical mass" of research and development capacity was necessary for the effective dissemination and use of environmentally sound technologies and their local production. In order to reach

that level, more education and training needed to be provided for technologists specialized in environmentally sound technology and with an interdisciplinary perspective. Local and national culture would have to be taken into account in the development and transfer of technology.

Annex

PROGRAMME OF THE CONFERENCE

Date	Time	Subject	Speaker
Monday 17 May 1993		Opening ceremony	
	0900-0910	Report	H. Djojodihardjo, Chairman of the Scientific Organizing Committee
	0910-0920	Address	H. Wiryosumarto, Chairman of the Indonesian International Space Year
	0920-0935	Welcoming address	K. Suwanda, Vice-Governor of the Province of Jawa Barat
	0935-0940	Address	A. A. Abiodun, Expert on Space Applications of the United Nations
	0940-0955	Opening address	B. J. Habibie, Minister of State for Research and Technology, on behalf of the President of Indonesia
		Opening session	
		Chairman: H. Wiryosumarto (Indonesia)	
		Rapporteurs: Adi S. Salatun (Indonesia) Dijardjana (Indonesia)	
	1030-1130	Keynote address	B. J. Habibie, Minister of State for Research and Technology
		General session	
		Chairman: Jusuf Hadimiarso (Indonesia)	
		Rapporteurs: Adi S. Salatum (Indonesia) Dijardjana (Indonesia)	
	1130-1230	Keynote speech: "Centre for Space Science and Technology Education: a United Nations initiative"	A. A. Abiodun, Expert on Space Applications of the United Nations

Date	Time	Subject	Speaker
		Plenary session I	
		Chairman: Mohammad Ilyas (Malaysia)	
		Rapporteurs: Siti Asiati (Indonesia) Sri Kaloka (Indonesia)	
	1400-1500	Keynote speech: "ICEAR (International Centre for Equatorial Atmospheric Research) Project"	Susumu Kato, Japan-Indonesia Science and Technology Forum, Tokyo
		Technical session I	
		Topics: Environment and climate observations Remote sensing Space communications Space science and technology Future development, cooperation and commercialization of space	
Tuesday 18 May 1993		Plenary session II	
		Chairman: Jacub Rais (Indonesia)	
		Rapporteurs: Wiweka (Indonesia) Munami (Indonesia)	
	0830-0930	Keynote speech: "Remote sensing brings people of South-East Asia closer than ever toward sustainable development"	Suvit Vibulsresth, National Research Council, Bangkok
		Technical session II	
		Topics: Environment and climate observations Remote sensing Space communications Space science and technology Future development, cooperation and commercialization of space	
		Plenary session III	
		Chairman: Arifin Nugroho (Indonesia)	
		Rapporteurs: Hadi Winarto (Indonesia) Adrianti PST (Indonesia)	
	0830-0930	Keynote speech: "Evolution of technology"	Iskandar Alisyahbana, ITB, Bandung, Indonesia

Date	Time	Subject	Speaker
		Technical session III	
		Topics: Environment and climate observations Remote sensing Space communications Space science and technology Future development, cooperation and commercialization of space	
Wednesday 19 May 1993	0800-0830	Visit to the Indonesian Aircraft Industry (PT.IPTN) facility at Bandung	
	0830-1200	Visit to space-related institutions and industries at Bandung	
		Plenary session IV	
		Chairman: Peter M. Bainum (United States of America)	
		Rapporteurs: Wisjnu P. Marsis (Indonesia) Victor P. Silalahi (Indonesia)	
	1330-1430	Keynote speech: "Status of the application and development of space technology in Indonesia"	H. Djojodihardjo, BPP Teknologi, Jakarta
		Technical session IV	
		Topics: Environment and climate observations Remote sensing Space communications Space science and technology Education	
Thursday 20 May 1993		Plenary session V	
		Chairman: H. J. Haubold (Office for Outer Space Affairs of the United Nations)	
		Rapporteurs: L. S. Manurung (Indonesia) Siti Asiati (Indonesia)	
		Keynote speech: "Regional cooperation in space"	O. Diran, LAPAN, Jakarta
		Technical session V	
		Topics: Environment and climate observations Remote sensing Space communications Space science and technology Education	

Date	Time	Subject	Speaker
		Plenary session VI	
	1330-1430	Keynote speech: "The economic benefits of satellite communications and three recently developed communication technologies"	A. J. Iorillo, Telecommunications and Space Sector, Hughes Aircraft Company, Los Angeles
		Technical session VI	
		Topics: Remote sensing Space science and technology Education	
		Panel discussion I	
	1615-1730	Discussion on cooperation and education in space science and technology	
		Topic: Education	
		Coordinators: Suvit Vibulsreth (Thailand) H. Dojodihardjo (Indonesia) H. J. Haubold (Office for Outer Space Affairs of the United Nations)	
		Topic: Cooperation	
		Coordinators: O. Diran (Indonesia) A. A. Abiodun (Office for Outer Space Affairs of the United Nations)	
	1900-2100	Lectures given by Conference participants to students from secondary schools and universities	
		Chairmen: V. J. Modi (Indonesia) Hadiwinarto (Indonesia)	
		Lectures: "Space transportation systems, past, present and future"	Peter M. Bainum, Howard University, Washington, D.C.
		"UN-COPUOS and legal works"	Priyatna Abdurrasyid, Yayasan Tetana Duta Konsulindo, Jakarta
		"Space science and human society"	Syuzo Isobe, National Astronomical Observatory of Japan, Tokyo

Date	Time	Subject	Speaker
		"The role of planetarium in the development of human resources in space science and technology"	Mazlan Othman, Planetarium Division, Malaysian Prime Minister's Department, Kuala Lumpur
Friday 21 May 1993		Plenary session VII	
		Coordinator: Priyatna Abdurrasyid (Indonesia)	
		Chairmen: Syuzo Isobe (Japan) Indroyono Susilo (Indonesia)	
		Rapporteurs: Victor P. Silalahi (Indonesia) Pardamean Hutahaean (Indonesia)	
	0830-0930	Keynote speech: "Need of space instrumentation for atmospheric environmental research in tropics"	Mohammad Ilyas, University of Science Malaysia, Kuala Lumpur
		Technical session VII	
		Topics: Remote sensing Space science and technology	
		Panel discussion II	
	1400-1530	Discussion on cooperation and education in space science and technology	
		Topic: Cooperation/education	
	1545-1645	Conclusions	
	1645-1715	Adoption of the report of the Conference	